2. Compliance and Enforcement

2.1 Overview

Primary responsibility for compliance and enforcement with the Energy Commission Energy Efficiency Standards rests with the local building department, which is typically associated with a city or county government. A building permit must be obtained form the local jurisdiction before a new nonresidential or high-rise residential building, outdoor lighting system, or a sign may be constructed, before constructing an addition, and before significant alterations may be made to existing buildings or systems. Before a permit is issued, the local jurisdiction examines the plans and specifications to verify that all applicable codes and standards are being complied with. Ensuring compliance with the Energy Efficiency Standards (Standards) are just one of the plan check responsibilities of the local jurisdiction. The plans examiner is also responsible for ensuring the plans comply with the building, plumbing, electrical, and the mechanical codes.

Once the local jurisdiction has determined that the proposed building (as represented on the plans) complies with all applicable codes and standards, a Building Permit is issued. This is the first significant milestone in the compliance and enforcement process. After building construction is complete, the local jurisdiction issues the Certificate of Occupancy, another significant milestone.

While obtaining the Building Permit and Certificate of Occupancy are two of the steps, the compliance and enforcement process is significantly more involved and requires participation by a number of other players. Other players in the process may include the architect or building designer, building developers, purchasing agent, general contractor, subcontractor/installers, energy consultant, plan checkers, inspectors, realtors, the owner, and third party inspectors (HERS raters). The purpose of this Chapter is to describe the overall process and identify the roles and responsibilities of each party.

2.2 The Compliance and Enforcement Process

The process of designing buildings that are energy efficient, comfortable, and in compliance with the Standards includes: the design process, obtaining a building permit, completing the compliance documentation, and constructing the building.

The process of complying with and enforcing the Energy Efficiency Standards involves many parties. Those involved may include the architect or building designer, building developers, purchasing agent, general contractor, subcontractor/installers, energy consultant, plan checkers, inspectors, realtors, the owner, and third party inspectors (HERS raters). Communication between

these parties is essential for the compliance/enforcement process to run efficiently.

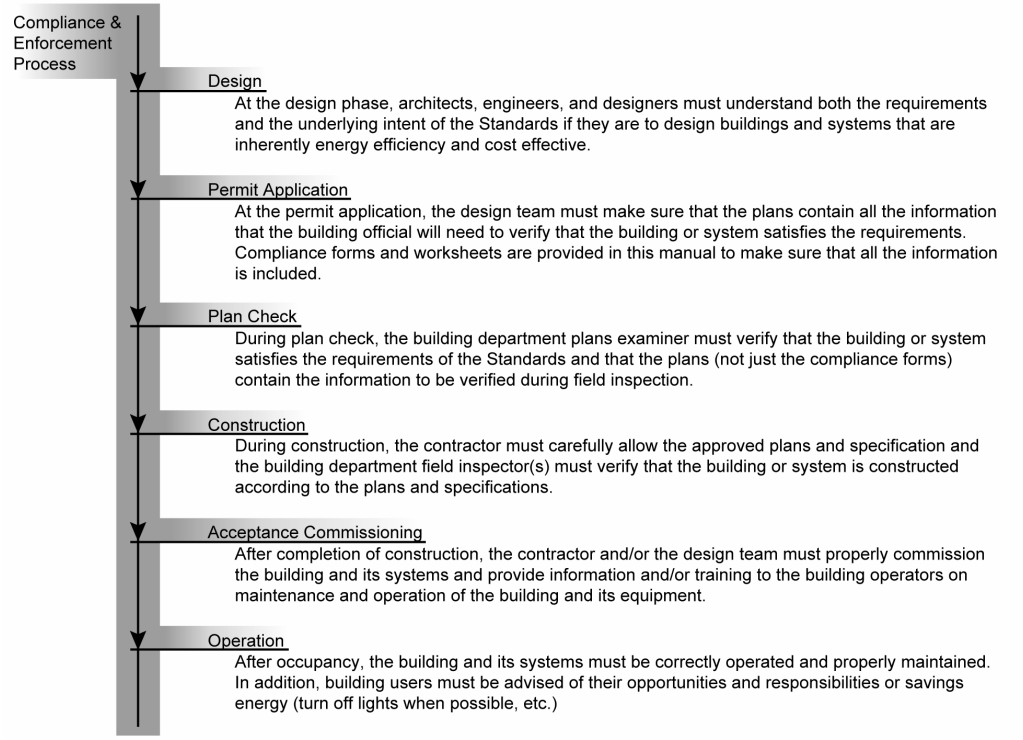

Figure 2-1 – The Compliance and Enforcement Process

2.2.1 Design Phase

§10-103(a)(2)

The design phase sets the stage for the type and style of building or system to be constructed. In addition to issues concerning zoning, building orientation and infrastructure layout, the building's or system's overall design and energy features are documented in the construction documents and/or specifications. Parties associated with this phase must ensure that the building or system complies with the Standards and that the significant features required for compliance are documented on the plans and/or specifications.

During the design process, the architect, mechanical engineer and lighting designer will typically make calculations to ensure that the building or system complies with the Standards. When appropriate, the design will be modified to achieve compliance.

Plans and specifications are required to contain details to show the building or system features that are necessary to achieve compliance with the Energy Efficiency Standards, including insulation levels, window performance, equipment performance, sealing and weather stripping requirements, and any other feature that is significant for compliance.

Integrated Design

Integrated design is the consideration and design of all building systems and components together. It brings together the various disciplines involved in designing a building or system and reviews their recommendations as a whole. It recognizes that each discipline's recommendations have an impact on other aspects of the building project. This approach allows for optimization of both building performance and cost. Too often, HVAC systems are designed independently of lighting systems, for example, and lighting systems are designed without consideration of daylighting opportunities. The architect, mechanical engineer, electrical engineer, contractors, and other team members each have their scope of work and often pursue it without adequate communication and interaction with other team members. This can result in oversized systems or systems that are optimized for non-typical conditions.

Even a small degree of integration provides some benefits. It allows professionals working in various disciplines to take advantage of efficiencies that are not apparent when they are working in isolation. It can also point out areas where trade-offs can be implemented to enhance resource efficiency. Design integration is the best way to avoid redundancy or conflicts with aspects of the building project planned by others.

The earlier that integration is introduced in the design process, the greater the benefit. For a high performance school, project team collaboration and integration of design choices should begin no later than the programming phase. In addition, the project team is likely to be more broadly defined than in the past, and may include energy analysts, materials consultants, lighting designers, life-cycle cost consultants and commissioning agents. Design activities may expand to include charrettes, modeling exercises, and simulations.

This manual provides details and implementation rules for individual design strategies. Though these individual strategies can improve a building's or systems energy efficiency, only through whole-building analysis and integrated design can energy and cost concerns be balanced most effectively.

2.2.2 Permit Application

§10-103(a)(2)

When the design is complete, construction documents are prepared, and other approvals (planning department, water, etc.) are secured, the owner, developer, or architect makes an application for a Building Permit at the local building department. This is generally the last step in a long process of planning and design. At this point, the infrastructure (streets, sewers, water lines, electricity, gas, etc.) is in place or is being constructed and it is time to begin the process of constructing the building or system.

To assist the building department in verifying that the proposed building or system complies with the Energy Efficiency Standards, a set of compliance documents are required to be submitted with the building permit application. If the prescriptive requirements are used, documentation for the building envelope, mechanical systems and the electrical and lighting systems must be submitted. If the performance method is used for the entire building, a single set of documentation may be presented.

The length and complexity of the documentation can vary considerably depending on the size and complexity of the building(s) or system(s) that are being permitted, whether the performance approach or the prescriptive approach is being used, and many other factors. The compliance documents are sometimes prepared by an energy consultant. An energy consultant understands the code and can help the design team comply with the Standards in the most cost effective manner.

The Administrative Standards [§10-103(a)(2)] require that documentation be submitted with permit applications that will enable the plans examiner to verify the building's or system's compliance with the Energy Standards. The forms used to demonstrate compliance must be readily legible and of substantially similar format and informational order as those specified in this manual.

2.2.3 Plan Check

Local building departments check plans for conformance to building standards. This includes health and safety requirements, such as fire and structural, along with energy requirements. Vague and/or missing details on the construction documents must be corrected or clarified. Complete plans help to speed the plan check process. In general the building department's responsibility is to verify that the information contained on the construction documents matches the information that is contained on the energy efficiency compliance documents. It is essential that the building represented on the plans and specifications complies with the Energy Efficiency Standards. The compliance documents are a tool to ensure this.

The building department is also responsible for verifying that the compliance documents do not contain errors. When the compliance documents are produced by an Energy Commission-approved computer program such as EnergyPro, there is less chance that there will be computational errors, but it is still the plans examiner's responsibility to verify that the building represented on the plans is the same building that is represented in the compliance documents.

2.2.4 Building Permit

When the plans examiner is satisfied that the building or system meets the Standards, the building permit is issued. This is the first significant milestone in the compliance and enforcement process. The building permit is the green light for the contractor to begin work. In many cases, the building permits are issued in phases. Sometimes there is a permit for site work and grading that precedes the permit for actual building construction. In large Type I or II buildings, the permit may be issued in several phases: site preparation, structural steel, etc.

2.2.5 Construction Phase

Upon receiving a building permit from the local building department, the general contractor can begin construction. The permit requires the contractor to construct the building or system in substantial compliance with the plans and specifications, but often there are variations. Some of these variations are formalized by the contractor through change orders. When change orders are

issued, it is the responsibility of the design team and the local jurisdiction to verify that compliance with the code is not compromised by the change order. In some cases, it will be quite clear if a change order would compromise compliance, for instance when an inexpensive single glazed window is substituted for a more expensive high performance window. Other times, it will be difficult to determine if a change order would compromise compliance, for instance when the location of a window is changed. Field changes that may result in non-compliance require building department approval of revised plans and energy compliance documentation demonstrating that the building is still in compliance.

During the construction process, the general contractor or specialty contractors are required to complete various construction certificates. The purpose of these certificates is to verify that the contractor is aware of the requirements of the Standards and that they have followed the Energy Commission-approved procedures for installation.

2.2.6 Building Department Field Inspection

Local building departments, or their representatives, inspect all new buildings or systems to ensure conformance to building standards. Field construction changes and non-complying energy features require parties associated with previous phases to repeat and revise their original efforts. The number of visits and the timing will depend on the size and complexity of the building or system.

2.2.7 Acceptance Testing

ACM Manual NJ

Acceptance testing is required for lighting and HVAC controls as well as equipment that are prone to miscalibration and failure. The equipment features that require acceptance testing are listed in the table below. Acceptance testing must be completed before the building official issues the certificate of occupancy. The procedures for performing the acceptance tests are documented in ACM Manual Appendix NJ. Process

The acceptance requirements require four major check-points to be properly enforced. They are:

- Plan review
- Construction inspection
- Testing
- Certificate of Occupancy

These will be discussed in more detail below.

Table 2-1 – Measures Requiring Acceptance Testing

Category	Measure
Outdoor Air	Variable Air Volume Systems Outdoor Air Acceptance
	Constant Volume System Outdoor Air Acceptance
Packaged HVAC Systems	Constant Volume Packaged HVAC Systems Acceptance
Air Distribution Systems	Air Distribution Acceptance
Indoor Lighting Control Systems	Automatic Daylighting Controls Acceptance
	Occupancy Sensor Acceptance
	Manual Daylighting Controls Acceptance
	Automatic Time Switch Control Acceptance
Air Economizer Controls	Economizer Acceptance
Demand Control Ventilation (DCV) Systems	Packaged Systems DCV Acceptance
Variable Frequency Drive Systems	Supply Fan Variable Flow Controls
Hydronic System Controls Acceptance	Variable Flow Controls
	Automatic Isolation Controls
	Supply Water Temperature Reset Controls
	Water-loop Heat Pump Controls
	Variable Frequency Drive Controls

Plan Review

The installing contractor, engineer of record or owner's agent shall be responsible for reviewing the plans and specifications to assure they conform to the Acceptance Requirements. This is typically done prior to signing a Certificate of Compliance. It is important to verify that all Standards requirements are satisfied at this step as making changes on paper is a lot less expensive than fixing or replacing non-compliant designs.

Construction Inspection

The installing contractor, engineer of record or owner's agent shall be responsible for performing a construction inspection prior to testing, including all necessary instrumentation, measurement and monitoring.

Testing

The installing contractor, engineer of record or owner's agent shall be responsible for undertaking all required acceptance requirement procedures. They shall be responsible for correcting all performance deficiencies and again implementing the acceptance requirement procedures until all specified systems and equipment are performing in accordance with the Standards.

The installing contractor, engineer of record or owner's agent shall be responsible for documenting the results of the acceptance requirement procedures including paper and electronic copies of all measurement and monitoring results. They shall be responsible for performing data analysis, calculation of performance indices and cross-checking results with the Standard. They shall be responsible for issuing a Certificate of Acceptance.

Certificate of Occupancy

Building departments shall not release a final Certificate of Occupancy until a Certificate of Acceptance is submitted that demonstrates that the specified systems and equipment have been shown to be performing in accordance with the Standards. The installing contractor, engineer of record or owner's agent upon completion of undertaking all required acceptance requirement procedures shall record their State of California Contractor's License number or their State of California Professional Registration License Number on each Certificate of Acceptance that they issue.

Forms

Acceptance tests are documented using a series of forms. Table 2-2 lists Lighting and Mechanical Forms and references Standards and ACM Manual Appendix sections.

Table 2-2 – Acceptance Forms

Section	Form Name	Standards Reference	ACM Manual Appendix Reference
Lighting	LTG-1-A Certificate of Acceptance	§10-103	N/A
	LTG-2-A Lighting Controls	§119(d) and §131(d)	NJ 6.2, 6.3 and 6.4
	LTG-3-A Automatic Daylighting	§119(e)	NJ 6.1
Mechanical	MECH-1-A Certificate of Acceptance	§10-103	N/A
	MECH-2-A Ventilation Systems – Variable and Constant Volume	§121(b)2	NJ 3.1 and 3.2
	MECH-3-A Packaged HVAC Systems	§121(b)2	NJ 4.1
	MECH-4-A Air Distribution Systems	§144(l)	NJ 5.1
	MECH-5-A Economizer	§144(e)	NJ 7.1
	MECH-6-A Demand Control Ventilation	§121(c)4.E.	NJ 8.1
	MECH-7-A Supply Fan VFD	§144(c)	NJ 9.1
	MECH-8-A Hydronic Systems Control	§144(j)6	NJ 10.1 – 10.5

2.2.8 Field Verification and/or Diagnostic Testing

When single-zone, constant volume systems serving less than 5,000 ft^2 of floor area have more than 25% of their duct area running through unconditioned spaces, the duct sealing is prescriptively required [§144(k)]. A third-party inspection of the site and verification that the air distribution ducts are tested and have been properly sealed is required. The Energy Commission has a process for certifying Home Energy Rating System (HERS) raters who perform third-party inspections. A certified third-party HERS rating is required when verification of duct sealing is necessary.

2.2.9 Occupancy Permit

The final step in the compliance and enforcement process is when Occupancy Permit is issued by the building department. This is the green light for the building to be occupied. While a developer might actually lease space before the occupancy permit is issued, the tenant can't actually move in until the building

department issues the occupancy permit. Until the Occupancy Permit is issued, the building is legally uninhabitable.

2.2.10 Occupancy

At the occupancy phase, the general contractor and/or design team is required to provide the owner with a manual that contains instructions for operating and maintaining the features of their building efficiently.

2.3 Compliance Documentation

2.3.1 Construction Documents

The compliance documentation consists of the plans and specifications for construction of the building or system as well as the calculations and compliance forms needed to demonstrate that the building complies with the Standards. It all starts with the plans and specifications. Known as the construction documents (or CDs) in the construction industry, the plans and specifications define the scope of work to be performed by the general contractor and the subcontractors.

2.3.2 Compliance Forms

For nonresidential buildings, the compliance forms are sometimes prepared by an energy consultant. The energy consultant works with the designer and the owner to review the building plans to determine if they comply with the Standards, makes recommendations to achieve compliance in the most cost-effective manner, and completes the Certificate of Compliance and other forms described in this manual.

At the time a building permit application is submitted to the building department, the applicant also submits plans and energy compliance documentation.

Table 2-3 – Compliance Forms

	Envelope	Mechanical	Lighting	Outdoor Lighting
Certificate of Compliance Forms and Worksheets	ENV-1-C Certificate of Compliance ENV-2-C Envelope Component Method ENV-3-C Overall Envelope Method ENV-4-C Skylight Area Support Worksheet	MECH-1-C Certificate of Compliance MECH-2-C Air System, Water Side System, Service Hot Water & Pool Requirements MECH-3-C Mechanical Ventilation MECH-4-C HVAC Misc. Prescriptive Requirements	LTG-1-C Certificate of Compliance LTG-2-C Indoor Lighting Schedule LTG-3-C Portable Lighting Worksheet LTG-4-C Lighting Controls Credit Worksheet LTG-5-C Indoor Lighting Power Allowance LTG-6-C Tailored Method Worksheet LTG-7-C Room Cavity Ratio Worksheet LTG-8-C Common Lighting Systems Method LTG-9-C Line Voltage Track Lighting Worksheet	OLTG-1-C Certificate of Compliance OLTG-2-C Lighting Compliance Summary OLTG-3-C Illuminated Area Calculation Worksheet OLTG-4-C Sign Lighting Compliance

2.3.3 Signing Responsibilities

The Certificate of Compliance is signed by the person responsible for preparation of the plans for the building and the documentation author. This principal designer is also responsible for the energy compliance documentation, even if the actual work is delegated to someone else (the Documentation Author described above).

The Certificate of Compliance is used by the building permit applicant, the plans examiner and the field inspector. This way, the permit application can call the plans examiner's attention to the relevant drawings sheets and other information and the plans examiner can call the field inspector's attention to items that may require special attention in the field. The compliance forms and worksheets encourage communications and coordination within each discipline.

It is necessary that the compliance documentation be consistent with the plans. The Business and Professions Code governs who is qualified to prepare plans, and therefore to sign this statement; the appropriate box on the form should be checked that describes the signer's eligibility.

Applicable sections from the Business and Professions Code (based on the edition in effect as of July 1998), referenced on the Certificate of Compliance are provided as follows:

5537. (a) This chapter does not prohibit any person from preparing plans, drawings, or specifications for any of the following:

(1) Single-family dwellings of woodframe construction not more than two stories and basement in height.

(2) Multiple dwellings containing no more than four dwelling units of woodframe construction not more than two stories and basement in height. However, this paragraph shall not be construed as allowing an unlicensed person to design multiple clusters of up to four dwelling units each to form apartment or condominium complexes where the total exceeds four units on any lawfully divided lot.

(3) Garages or other structures appurtenant to buildings described under subdivision (a), of woodframe construction not more than two stories and basement in height.

(4) Agricultural and ranch buildings of woodframe construction, unless the building official having jurisdiction deems that an undue risk to the public health, safety, or welfare is involved.

(b) If any portion of any structure exempted by this section deviates from substantial compliance with conventional framing requirements for woodframe construction found in the most recent edition of Title 24 of the California Code of Regulations or tables of limitation for woodframe construction, as defined by the applicable building code duly adopted by the local jurisdiction or the state, the building official having jurisdiction shall require the preparation of plans, drawings, specifications, or calculations for that portion by, or under the responsible control of, a licensed architect or registered engineer. The documents for that portion shall bear the stamp and signature of the licensee who is responsible for their preparation. Substantial compliance for purposes of this section is not intended to restrict the ability of the building officials to approve plans pursuant to existing law and is only intended to clarify the intent of Chapter 405 of the Statutes of 1985.

5537.2. This chapter shall not be construed as authorizing a licensed contractor to perform design services beyond those described in Section 5537 or in Chapter 9 (commencing with Section 7000), unless those services are performed by or under the direct supervision of a person licensed to practice architecture under this chapter, or a professional or civil engineer licensed pursuant to Chapter 7 (commencing with Section 6700) of Division 3, insofar as the professional or civil engineer practices the profession for which he or she is registered under that chapter.

However, this section does not prohibit a licensed contractor from performing any of the services permitted by Chapter 9 (commencing with Section 7000) of Division 3 within the classification for which the license is issued. Those services may include the preparation of shop and field drawings for work which he or she has contracted or offered to perform, and designing systems and facilities which are necessary to the completion of contracting services which he or she has contracted or offered to perform.

However, a licensed contractor may not use the title "architect," unless he or she holds a license as required in this chapter.

5538. This chapter does not prohibit any person from furnishing either alone or with contractors, if required by Chapter 9 (commencing with Section 7000) of Division 3, labor and materials, with or without plans, drawings, specifications, instruments of service, or other data covering such labor and materials to be used for any of the following:

(a) For nonstructural or nonseismic storefronts, interior alterations or additions, fixtures, cabinetwork, furniture, or other appliances or equipment.

(b) For any nonstructural or nonseismic work necessary to provide for their installation.

(c) For any nonstructural or nonseismic alterations or additions to any building necessary to or attendant upon the installation of those storefronts, interior alterations or additions, fixtures, cabinetwork, furniture, appliances, or equipment, provided those alterations do not change or affect the structural system or safety of the building.

6737.1. (a) This chapter does not prohibit any person from preparing plans, drawings, or specifications for any of the following:

(1) Single-family dwellings of woodframe construction not more than two stories and basement in height.

(2) Multiple dwellings containing no more than four dwelling units of woodframe construction not more than two stories and basement in height. However, this paragraph shall not be construed as allowing an unlicensed person to design multiple clusters of up to four dwelling units each to form apartment or condominium complexes where the total exceeds four units on any lawfully divided lot.

(3) Garages or other structures appurtenant to buildings described under subdivision (a), of woodframe construction not more than two stories and basement in height.

(4) Agricultural and ranch buildings of woodframe construction, unless the building official having jurisdiction deems that an undue risk to the public health, safety or welfare is involved.

(b) If any portion of any structure exempted by this section deviates from substantial compliance with conventional framing requirements for woodframe construction found in the most recent edition of Title 24 of the California Administrative Code or tables of limitation for woodframe construction, as defined by the applicable building code duly adopted by the local jurisdiction or the state, the building official having jurisdiction shall require the preparation of plans, drawings, specifications, or calculations for that portion by, or under the direct supervision of, a licensed architect or registered engineer. The documents for that portion shall bear the stamp and signature of the licensee who is responsible for their preparation.

6737.3. A contractor, licensed under Chapter 9 (commencing with Section 7000) of Division 3, is exempt from the provisions of this chapter relating to the practice of electrical or mechanical engineering so long as the services he or she holds himself or herself out as able to perform or does perform, which services are subject to the provisions of this chapter, are performed by, or under the responsible supervision of a registered electrical or mechanical engineer

insofar as the electrical or mechanical engineer practices the branch of engineering for which he or she is registered.

This section shall not prohibit a licensed contractor, while engaged in the business of contracting for the installation of electrical or mechanical systems or facilities, from designing those systems or facilities in accordance with applicable construction codes and standards for work to be performed and supervised by that contractor within the classification for which his or her license is issued, or from preparing electrical or mechanical shop or field drawings for work which he or she has contracted to perform. Nothing in this section is intended to imply that a licensed contractor may design work which is to be installed by another person

2.4 Roles and Responsibilities

Effective compliance and enforcement requires coordination and communication between the architects, engineers, lighting and HVAC designers, permit applicant, contractors, plans examiner and the field inspector.[1] This manual recommends procedures to improve communication and, therefore, compliance with the Standards.

The building design and construction industry, as well as building departments are organized around engineering disciplines.[2] The design of the building's electrical and lighting system is typically the responsibility of the lighting designer, electrical engineer or electrical contractor. This person is responsible for designing a system that meets the Standards, producing the plans and specifications, and for completing the compliance forms and worksheets. In larger building departments, an electrical plans examiner is responsible for reviewing the electrical plans, specifications and compliance documents and an electrical field inspector is responsible for verifying the correct installation of the systems in the field. This same division of responsibility is typical for the mechanical systems: the mechanical plans examiner is responsible for reviewing the mechanical plans; and the mechanical field inspector is responsible for verifying correct construction in the field. For the building envelope, the architect is typically responsible for designing the building and completion of the forms, the building official is responsible for reviewing the design and forms and the building field inspector is responsible for verfying the construction in the field.

Unless the whole building performance approach is used, the compliance and enforcement process can be completed separately for each discipline. This enables each discipline to complete its work independently of others. To facilitate this process, compliance forms have been grouped by discipline. These groupings include Standards worksheets for calculations and a summary form which includes a checklist. Permit Applicant Responsibilities

The permit applicant is responsible for:

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[1] For small projects, an architect or engineer may not be involved and the contractor may be the permit applicant.

[2] Small building departments may not have this type of specialization.

- Providing information on the plans and/or specifications to enable the building official to verify that the building satisfies the Standards. It is important that the necessary information be included on the plans. The plans are the official record of the permit and the field inspector will generally not have a copy of the worksheets or compliance forms with them in the field. The design professional is responsible for certifying that the plans comply with the Standards.
- Performing the necessary calculations to show that the building or system meets the Standards. These calculations are documented on the drawing or on the worksheets provided in the manual and supported when necessary with data from national rating organizations or product and/or equipment manufacturers.
- Completing the Certificate of Compliance. The Certificate of Compliance is a listing of each of the major requirements of the Standards. The summary form includes information from the worksheets and references to the plans where the plans examiner can verify that the building or system meets the Standards.

2.4.1 Plans Examiner Responsibilities

The plans examiner is responsible for:

- Reviewing the plans and supporting material to verify that they contain the necessary information for a plan check.
- Checking the calculations and data contained on the worksheets.
- Indicating by checking a box on the summary forms that the compliance documentation is acceptable.
- Making notes for the field inspector about which items require special attention.

2.4.2 Field Inspector Responsibilities

The field inspector is responsible for:

- Verifying that the building or system is constructed according to the plans.
- Checking off appropriate items on the summary form at each relevant inspection.

The Certificate of Compliance is used by the building permit applicant, the plans examiner and the field inspector. This way, the permit application can call the plans examiner's attention to the relevant drawings sheets and other information and the plans examiner can call the field inspector's attention to items that may require special attention in the field. The compliance forms and worksheets encourage communications and coordination within each discipline.